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A NATIONAL POLICY FOR AGRICULTURAL RESEARCH[1]

THERE should be a well-defined national policy in reference to agricultural research because such research relates to questions of fundamental national importance and the value of such research to the whole nation has been proved; furthermore, agricultural problems affecting the national welfare are becoming more and more numerous and complex and research must be enlarged to enable us to cope with them.

The policy should be to provide ample support for the investigation of problems relating to the decrease of cost of producing farm products and their more efficient distribution and marketing, the improvement of their quality, the conservation of soil fertility and the betterment of rural life.

The policy also should be to encourage co-operation of all public agencies engaged in agricultural research, and to provide for proper supervision,—enough of each to produce the highest possible efficiency and not so much as to hamper efficiency.

Sound arguments in plenty can be given to support these statements.

THE IMPORTANCE OF AGRICULTURE AS A FUNDAMENTAL INDUSTRY

About forty per cent. of the population of our country is engaged in agriculture. There are nearly six and one-half million (6,448,366) farms, including nearly one billion (955,676,545) acres. Each farm is an independent unit, and the character of the homes on these farms has a profound influence on the character of our nation.

The value of farm lands is estimated to be over sixty-six billion dollars ($66,334,309,556).

[1] Read at the President's Conference on the Agricultural Situation, Washington, D. C., January 26, 1922.

The value of implements and machinery is estimated to exceed three and one-half billion dollars ($3,598,317,021). The estimated value of live stock is nearly eight billion dollars ($7,996,362,496). The total of these great investments is about seventy-eight billion dollars ($77,925,989,073).

The value of the annual production of our farms far exceeds that of any other industry. It is equivalent to the value of all manufactures over the costs of raw materials. The value of farm products exported from the United States has averaged over two billion dollars ($2,062,000,000) per year the past ten years and constituted an average of 44.4 per cent. of all domestic exports.

In brief, it is sufficient to say that agriculture is our largest industry; it furnishes practically all of our food, the material for all of our clothes, the raw material for the larger part of the manufacturing industries of the nation, about one-half of the gross earnings of the railroads of the country, a consumptive market for nearly one-half of all the manufactured products sold on our markets and, lastly, agriculture furnishes a constant stream of rugged people who quickly find positions of service in the great centers of population.

THE PRESENT ORGANIZATION FOR RESEARCH

Research has been applied to all phases of human activities but research in agriculture has been relatively late in development. It came with a growing concern for the future of agriculture,—an appreciation that as long as man lives agriculture must be a permanent industry and as population increases agriculture must be increasingly efficient.

The policy of encouraging agricultural research started in the states. Agricultural experiment stations were established in Connecticut and California as early as 1875, in North Carolina in 1877, and in fifteen other states prior to 1887 when the Hatch Act became effective. In 1906 the Adams law was passed. Those two laws are formal acknowledgement by Congress that agricultural research is an important national question. Under each of these laws every state receives $15,000 annually for agricultural research, making $1,440,000 from the Federal treasury. State appropriations for the same purpose amount to about three million dollars annually. Research work in the states stimulated similar work in the Federal Department of Agriculture which is now by far the largest single organization conducting agricultural research. This department gives attention principally to problems of national or regional character, and engages in cooperative research work with the State experiment stations to a large extent. It would be impracticable for the Federal department to care for all the problems pressing for solution and wisely that is not attempted. The states are in intimate contact with their own problems and so far as funds permit give these problems prompt and usually sufficient attention.

THE RESULTS OF AGRICULTURAL RESEARCH

The benefits of agricultural research are so well known that it is hardly necessary to mention them. For example: A farmer produced pork at a cost of forty-four cents per pound until he made use of information gained from research and then he reduced his cost to four cents per pound. Through instruction based upon research and widely disseminated to the farmers, one state has shown how to reduce losses from the Hessian fly to the extent of twenty million bushels of wheat in four years, —and all this at only a nominal expense. Research has made it possible to continue growing important crops in sections of the country where some pest or disease was turning the farmers' efforts to naught. About ten years ago the United States Senate showed that scientific research in the Department of Agriculture, costing about five million dollars annually, had resulted in saving about five hundred million dollars annually.

Books could be filled with interesting stories such as how the cause of wheat rust was discovered and a remedy applied and how Texas cattle fever was placed under control and is being surely eradicated and many other similar exploits. Add to all this the development of improvements of animals and plants and of agricultural methods generally.

Research is the foundation of our whole

system of agricultural education in colleges and schools, through the Extension Service, and through agricultural journals and books. It also is the basis for regulatory laws and their enforcement.

It would be impossible to tell what would be the situation in this country if agricultural research had not been maintained. We know some of the most important improved varieties of plants and some of the better strains of animals would be missing. Some diseases of animals and food plants would be rampant. Great areas of soil now producing crops would be barren, and the production from still larger areas would be lowered. Farmers would be paying more for their supplies and some highly effective marketing methods would not be known.

MORE RESEARCH IS NEEDED

It is unfortunate that the research agencies of the country are unable to keep pace with the demands being made upon them. The experience of the past, the present situation, and a view into the future emphasizes the necessity of enlarging the system. A sound and efficient agriculture calls for more research. The development of some phases of agriculture, representing millions of dollars to farmers and to other citizens, awaits the enlargement of research activities. As the country becomes older and its population increases and quicker transportation is developed, new problems constantly appear. Some persons who are not informed think we are doing quite well at the present time and agricultural research might be kept on its present basis or even it might take a vacation for a few years. But the germs and the fungi now on their way to favorable locations throughout the country will not pause on their journey, and plant food will continue to be depleted when crops continue to be taken from the soil.

Research problems might be divided into two great groups. The first would include the new difficulties that are constantly arising and must be overcome to keep agriculture in its present position, such as a new insect pest. The second would include such questions as the improvement of existing methods which means a better agriculture. Originally the second group of questions constituted most of the research work performed. More and more questions in the first group have been coming to the front in recent years until now they demand a very large part of the research resources.

New methods for reducing cost of production, the better distribution of farm products, and better methods of marketing are sorely needed at this time. This is in the interest of the average citizen who buys all his supplies, because such methods will help to reduce the cost of living. This is in the interest also of farmers because better methods will increase the profits of farming. Both benefits are worthwhile. But a chief reason for decreasing the cost of farm production is the importance of holding our position in the markets of the world. We ought to get a better hold upon those markets especially in so far as certain manufactured farm products are concerned. If we wish to sell to Great Britain at a profit we must be able to make a lower price than others can make. We used to export about one hundred forty million pounds of cheese annually, but before the Great War these exports had fallen to two or three million pounds. We like to say that we are not exporting cheese because our larger population is consuming it all. But why did not our cheese production increase with our population? The chief reason was that Canada could do better than we could do in making a favorable price on cheese in the English markets. The outcome of such competition depends largely upon the results of our research for superior and less expensive methods.

Our natural resources plus our skill plus our shipping ability are in competition with the natural resources of other countries plus their skill plus their shipping ability plus their cheaper labor which involves lower living standards. If we are to win from them we must depend chiefly upon our superior knowledge. Some other countries have as good natural resources as ours. Sometimes they are even better because of virgin lands. Other countries

have as favorable transportation. Most countries have cheaper labor. We must overcome their advantages by our knowledge which must be developed through research.

When we find an economy in feeding or some method of reducing cost per bushel or when we invent an improved harvester or perfect a silo, or when we find more direct and efficient methods of marketing, we are able to reduce our selling price and thus strengthen our hold on foreign markets. When we allow a mysterious disease or inefficient methods to increase the price we must ask whether we are losing our hold on foreign markets.

We must not forget that in other countries strenuous efforts also are being made to devise better methods through research in order to take the foreign markets away from us and even to invade our home markets. Thus far we have developed only a background of information regarding the great economic questions. We have hardly crossed the threshold in research concerning the adaptation of production to requirements and other such great economic problems.

Other vitally important subjects waiting to be studied as they deserve include the reforestation on farms and the betterment of rural life. There are many questions relating to the comfort and happiness of people who live in the country that are becoming constantly more acute. These include the whole sphere of the work of farm women. The failure to solve these questions is resulting in some of the best of type of farmers moving from the country to the city. Much needs to be done to show such people how to make country life as satisfactory as city life.

One other of many very important problems in need of research may be mentioned,—the conservation of soil fertility. This is the most important of our natural resources. It is easily removed but not easily replaced. We gather crops very much as we harvest lumber. Most people know how we have accomplished such an enormous production of lumber during the past few decades. We simply went into the forests which had required hundreds of years to grow and we took the trees that were wanted and even gave scant consideration to the welfare of other trees which might have become useful in later years. We have not considered how succeeding generations will get their lumber. We have proceeded on the basis that we might as well take it all. We point to our lumber kings as examples of great business ability. What will be said of them fifty years from now when the people of that day want lumber and find that the accumulated growth of centuries over large areas has been destroyed by our generation and even without much effort to start new trees for use in the future? Our cereal production has been carried along on about the same lines. If present practices continue this nation will awaken some day to the fact that we are more like arid Egypt or Babylon than the wonderful, fertile country that our historians tell us was discovered by Columbus.

Furthermore, we are allowing many square miles of good farm land each year to be washed away by our streams. This erosion supplemented by surface wash amounts to hundreds of millions of tons annually. These losses represent stupendous values which doubtless could be largely reduced through further research.

No one can tell what wonderful improvements in agriculture may be revealed in the future. We easily think of possible further advances along the lines we know about but these may be made secondary by other advances that we can not now even think of. Some persons believe that beneficial changes are yet to come in agriculture which are no less profound than the changes in transportation caused by the flying machine or in communication caused by the wireless telephone. Those two improvements are epoch making but were hardly within our range of thinking a generation ago.

I will not be so rash as to suggest that a tin Lizzie ever will give milk, but I will predict that some day power for the farm which now constitutes a chief item of expense will be obtained cheaply from the winds that blow over the farm. And with this cheap power I predict that some day we will produce the best of building materials, at lowest cost, from almost any soil. It may be aluminum.

I will predict also that if our plant and

animal experts are given reasonable support they will find, in good time, new and good foods now unknown, and if our economists and other experts are given reasonable support they will show how our cities may be assured of an abundant supply of farm products at all times and at cost reductions that will exceed previous cost reductions that have been so welcome to both farmer and consumer.

DEVELOPMENT OF A POLICY

We should no longer delay the development of a more comprehensive national policy for agricultural research. It should provide for liberal federal and state financial support. The best recent testimony comes from the Congressional Joint Commission of Agricultural Inquiry (Congressional Record, December 14, 1921, page 421). Members of this Commission after a long and thorough study report as follows:

"Agriculture is subject to special hazards resulting from the weather and climatic conditions, animal and plant diseases and insect pests. These hazards reduce farming to a gigantic gamble. But methods of production can be adapted to the end of reducing losses from climatic and weather conditions to the minimum. Plant and animal diseases and insect pests can, to a certain degree, be controlled. But the means and the method of reducing or controlling these hazards can not be worked out on the farm by the individual farmer. The investment even of the largest is not sufficient to permit the maintenance of the organization necessary for the study and formulation of these means and methods. A program of agricultural development therefore must include provisions for an expanded and coordinated program of practical scientific investigation, through State and National departments of agriculture and through agricultural colleges and universities, directed toward reducing the hazards of climatic and weather conditions and of plant and animal diseases and insect pests."

One strong reason for using public funds to support agricultural research is that the knowledge to be derived should be made available to every farmer throughout the country who wants it. It should never happen in this country that knowledge relating to agricultural production shall be limited in its application to private interests because it was developed at the expense of those interests. It may not be improper in other lines of business for individuals or concerns to have a monopoly on knowledge and thus enable them to develop a business monopoly. But this should never be possible in agriculture. A cornerstone of our national strength is the independent farm families who are able to maintain themselves on an independent basis because every farmer is entitled to know all of the secrets of his business that anyone knows.

APPRECIATION OF AGRICULTURAL RESEARCH

(1) What should be insured first in a national policy? Agricultural research needs first of all the appreciation and good will of the public. Until this is given the research will be heavily handicapped.

Secretary of Agriculture Wallace declares that research is the basic work of his department and it is research that little by little is crystallized into agricultural progress. The public should get this idea. The Congress and legislatures should have it. An intelligent appreciation of agricultural research, especially among leaders and public men, a genuine respect for it, an understanding of its importance and its requirements, are the primary essentials in developing an effective national policy. Such an appreciation exists today but in a very restricted sense. Belief in the importance of research is too much of an abstract character, an acknowledgement that it is useful in a general way, an acceptance of the fact that it is desirable, but without real sympathy for it or understanding of its requirements. Thus the public fails to demand it in order that the nation's interests may benefit. One thoughtful student gives as one of the reasons for advocating national support for agricultural research the fact that national appreciation needs the stimulus of direct interest which comes with the discussion of the subject in the halls of Congress and the making of an appropriation. There are, however, other and better arguments.

An intelligent appreciation of agricultural

research is not evidenced in any large way by the recent action of Congress, let us say a very few members of Congress, by which the publication of two periodicals in the interest of agricultural research was suddenly ordered discontinued along with a lot of other publications of questionable value, most of which had developed during or soon after the war period. There is encouragement in the fact that some leading members of Congress were not informed as to what was occurring but now realize that a serious mistake has been made and are ready to help correct it.

ESSENTIALS FOR RESEARCH

Well trained men and ample funds are the essentials for research. It should be a national policy to train and encourage in every way possible the right kind of men and women and to supply funds to meet their reasonable needs in research work in the interest of agriculture.

(2) Efforts should be made always to encourage young men and women who have ability and inclination of the right kind, to prepare themselves for research work. Special scholarships and fellowships should be provided by the agricultural educational institutions to enable such persons to complete their fundamental training and later assistantships should be provided to bring them into helpful contact with older and well trained investigators and due credit should be allowed for their own efforts. As they advance in ability and in getting worthwhile results their compensation should be reasonably increased. Care should be taken to make this compensation as attractive as is provided for persons of corresponding ability and service in allied lines of work. Failure in this respect in recent years has resulted in heavy losses from the ranks of research workers in the Department of Agriculture and in State experiment stations. During a period of about six years, including the war, there was a change of nearly eighty per cent. in the scientific personnel engaged in agricultural research throughout the country. Many of the younger men went into war service, but the greater losses to agricultural research came from the resignation of older men who took other more renumerative positions. The overturn has been exceedingly large since the war. On this account, and without reflection upon those who have continued in research work or who have recently gone into that work, it must be admitted that research to-day, instead of being the strongest link in the chain made up of research, college education, and extension work, is the weakest link. Research is the least able of the three to meet the demands it should care for.

Funds for the support of agricultural research as now available represent such a small percentage of the interests concerned that they are almost negligible by comparison. They represent a much smaller per cent. of value of output than is so expended by many a manufacturing plant in the interest of its output.

(3) A principal requirement as to funds is assurance of permanent income. Without such assurance strong men can not be induced to prepare themselves adequately for research nor can they be retained in this work. Too often it has been necessary to stop important experimental work because of failure to continue appropriations. No one can tell what losses have been suffered because important projects after being conducted for an extended period of time had to be discontinued with the failure of appropriations before the final results had been secured.

(4) As agricultural research relates in such large measure to national problems, and the work done in one state is of value in many states and as agriculture is such a large factor in all business, it is right that national funds should be used in promoting agricultural research in the different states. A precedent has been furnished, and a national policy for agricultural research should provide for enlarging these national appropriations by small increments for a few years until they have reached amounts commensurate with present demands, as specified in the Purnell Bill, which would provide fifteen thousand dollars annually additional to each state for experiment station work and an additional ten thousand each year until the amount is eighty-five thousand dollars. These appropriations would be equivalent at the start to less than one cent per capita per year and would finally increase to about

four cents per capita. This measure, or other similar relief, should be enacted as soon as possible. It is preferable from the standpoint of efficiency to make the appropriation with the fewest possible conditions, as was done in the Hatch and Adams Acts, rather than to continue the requirement for offset funds, as provided in the Smith-Lever and Smith-Hughes Acts. As compared with the Federal government it seems that the states now are carrying their full share.

In considering appropriations for agricultural research it is well to remember that when our taxes are increased for this purpose our involuntary taxes, or those which are levied by powers beyond our control, are decreased many times more than the voluntary taxes are increased.

COOPERATION AND SUPERVISION

(5) A national policy fostering agricultural research should provide for more definite and constructive cooperation by research agencies than now obtains.

(6) It must provide also for certain supervision to assure the proper use of public funds, and this is expected and welcomed. A reasonable amount of cooperation and supervision is stimulating. An excess is deadening.

(7) A more definite agreement on the fields to be occupied by the Department of Agriculture on the one hand and by the State experiment stations on the other hand, with better coordination of work and a larger provision for joint effort, should form a part of the policy for further developing agricultural research. Such a definition of function and joint effort would guard against undesirable duplication and would result in better directed efforts. Details should be worked out by representatives of the Secretary of Agriculture and the agricultural colleges and when properly approved should form a fundamental law. Once each year this joint agreement should be considered by duly chosen representatives for the purpose of making it more perfect. Among other things, it should provide for the wise selection of projects for investigation and for inviting experiment stations in different states or the Federal Department of Agriculture to give attention to different phases of a project requiring investigation at different places. All projects should be briefly but clearly described and recorded in the Department of Agriculture at Washington and all interested persons should be informed as to the kinds of work in progress. From time to time, at least once a year, the progress of each project should be officially reported and checked. When a project is undertaken, work on it should continue to a reasonable extent until it is finished or formally set aside, and care should be taken not to provide for starting new projects for any laboratory or station when it has too many projects unfinished.

(8) While a national policy for agricultural research should not enter the details of local administration, it should encourage the types of organization which would be most efficient.

SHALL WE HAVE AMPLE AGRICULTURAL RESEARCH?

An effort has been made to suggest a picture of our country as it would be without properly supported agricultural research, and again with such research. If this work is properly developed, agriculture will continue on a permanent and profitable basis in the face of ever increasing obstacles. And this nation with a strong agriculture will continue to furnish its own great commodities which come from the farms and will profit further from large sales of the surplus in other countries. The time is ripe for stimulating a national policy for agricultural research which will contribute to this great end.

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THE 1921 EXPEDITION OF THE CALIFORNIA ACADEMY OF SCIENCES TO THE GULF OF CALIFORNIA

IN the spring of 1921 the California Academy of Sciences sent a well-equipped scientific expedition to the Gulf of California. The purpose of the expedition was primarily to make as thorough study as possible of the fauna and flora of the islands in the Gulf and of certain important localities on